

***Siamoglaris zebrina* gen. n., sp. n., the first representative of Prionoglarididae from the Oriental Region (Insecta: Psocoptera)**

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***Siamoglaris zebrina* gen. n., sp. n., the first representative of Prionoglarididae from the Oriental Region (Insecta: Psocoptera).** - *Siamoglaris zebrina* gen. n., sp. n. is described and illustrated from a male specimen collected in Thailand. The new genus is closely related to the Palearctic genus *Prionoglaris* Enderlein. Illustrations of the type species of that genus, *P. stygia* Enderlein, are also given. The systematic position of these two genera within the family Prionoglarididae is discussed and the family is subdivided into two subfamilies: Prionoglaridinae Badonnel and Speleketorinae Smithers. A key to the adults of the genera of the family Prionoglarididae is provided.

Keywords: Prionoglaridinae - Speleketorinae - *Prionoglaris* - *Speleketor* - *Sensitibilla* - new genus - new species - mouthparts - cave fauna - Thailand.

INTRODUCTION

The family Prionoglarididae (sensu Mockford, 1984 and Lienhard, 2000), at present assigned to the suborder Trogiomorpha and the infraorder Psocathropetae, comprises the following three genera: *Prionoglaris* Enderlein, 1909 (three species known), *Speleketor* Gurney, 1943 (three species) and *Sensitibilla* Lienhard, 2000 (monotypic) (cf. Lienhard & Smithers, 2002 and Lienhard, 2000). A family diagnosis can be found in Mockford (1993) and Lienhard (1998). The distribution of all known species is discussed in detail by Lienhard (2000) and an exhaustive bibliography concerning synonymies and faunistics is presented by Lienhard & Smithers (2002). The three genera have a vicariant distribution on different continents: *Prionoglaris* is known from the western Palearctic (reaching east to Afghanistan), *Speleketor* from the Nearctic (southern USA) and *Sensitibilla* from the Ethiopian Region (Namibia). Most species live predominantly in caves or similar subterranean habitats (under stones or within rocky debris) (cf. Badonnel & Lienhard, 1994 and Lienhard, 2000).

In this paper the first representative of this family from the Oriental Region is described from a single male collected in a dry stream bed near Wang Badan Cave in western central Thailand. The new species is related to the genus *Prionoglaris*, but it is unique in many aspects of its morphology, so that the erection of a new genus appears justified.

The following abbreviations are used in the descriptions: BL = body length (in alcohol); IO/D = shortest distance between compound eyes divided by anteroposterior diameter of compound eye in dorsal view of head; P1-P4 = articles of maxillary palpus; f1, f2, f3, ... = antennal flagellomeres; F = hindfemur; T = hindtibia; t1, t2, t3 = tarsomeres of hindtarsus (lengths measured from condyle to condyle); FW = forewing; PS = pterostigma of forewing; HW = hindwing. For standard abbreviations concerning wing venation, see Lienhard (1998).

DESCRIPTIONS OF NEW TAXA

Siamoglaris gen. n.

Diagnosis (see also key to the genera of Prionoglarididae, below). General habitus very similar to *Prionoglaris* (cf. Plate 1A). Differing from *Prionoglaris* by the following characters. Compound eye with distinct colour pattern (Fig. 1a). Maxillary palpus relatively short, about half of head length (measured in frontal view, from edge of vertex to tip of labrum), with P3 shorter than half of P4 (Fig. 10). Terminal article of labial palpus shorter than twice its width (Fig. 8). Vein *an*₂ of forewing present (Fig. 3). Preapical claws strikingly asymmetrical, membranous extension of anterior preapical claw of each leg strongly developed, covering almost the whole claw (Fig. 5). Phallosome (Fig. 11): medioventral process short and rounded, with a pair of membranous ventrolateral blisters; mediointernal process well-developed, apically with a pair of sclerotized claspers; dorsolateral processes (= external parameres?, see "Discussion") well-developed, bearing some lateral pores.

Type species. *Siamoglaris zebrina* sp. n.

Etymology. The genus name is of feminine gender and refers to the country of origin of its type species (Siam is an old name for Thailand) and to the most closely related genus *Prionoglaris* ("glaris" is the Greek word for chisel, referring to the lacinia which shows a very particular morphology in these genera).

Siamoglaris zebrina sp. n.

Figs 1 and 3-15

MATERIAL

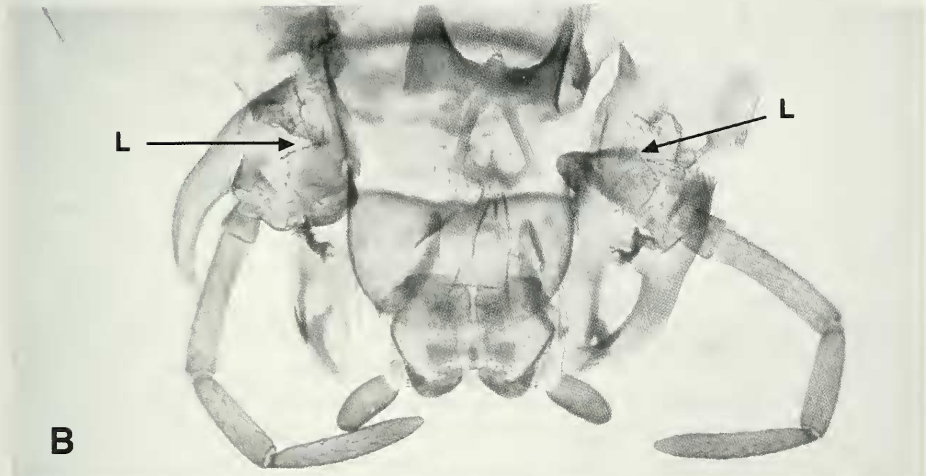
Holotype . THAILAND (Kanchanaburi Province, Sai Yok District): near Wang Badan Cave, ca. 2 km N of Sai Yok Noi Waterfall (14° 14' N, 99° 03' E), 220 m, dry stream bed (on low vegetation), 9.XII.2003, leg. P. Schwendinger (TH-03 17). Deposited at the Muséum d'histoire naturelle, Geneva (Switzerland). The specimen has been completely dissected and mounted on four slides. Before mounting its exoskeleton the pterothorax has been sent to Kazunori Yoshizawa (Sapporo) for DNA extraction, after having detached all wings and legs. NOTE: The type locality is situated very close to Wang Badan Cave, about 200-300 m from its main entrance, in a rocky limestone region full of subterranean crevices (cf. remarks on biology, below).

PLATE 1

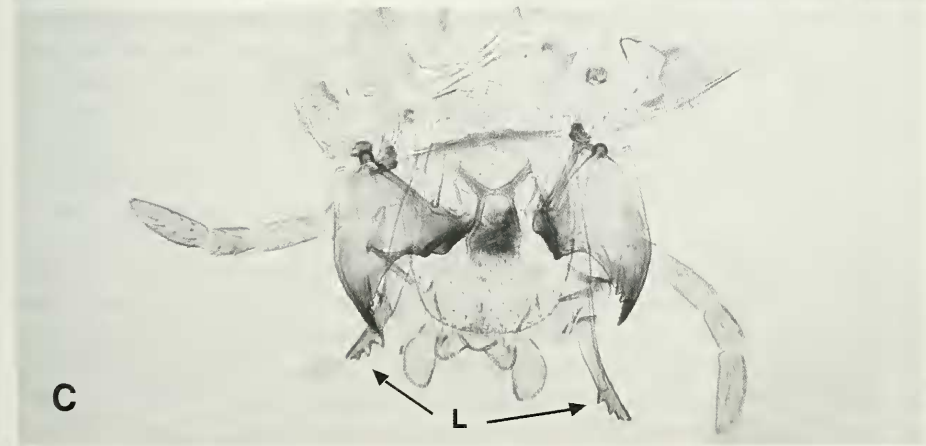
Prionoglaris stygia Enderlein (from cave "Grotte inférieure du Queire", French Pyrenees, cf. Lienhard, 1988). A: live male, habitus. B: male, mouthparts (slide-mounted, in occipital view; L = remnant of lacinia). C: nymph, mouthparts (slide-mounted, in frontal view; L = lacinia, retracted on right side).



A



B



C

ETYMOLOGY

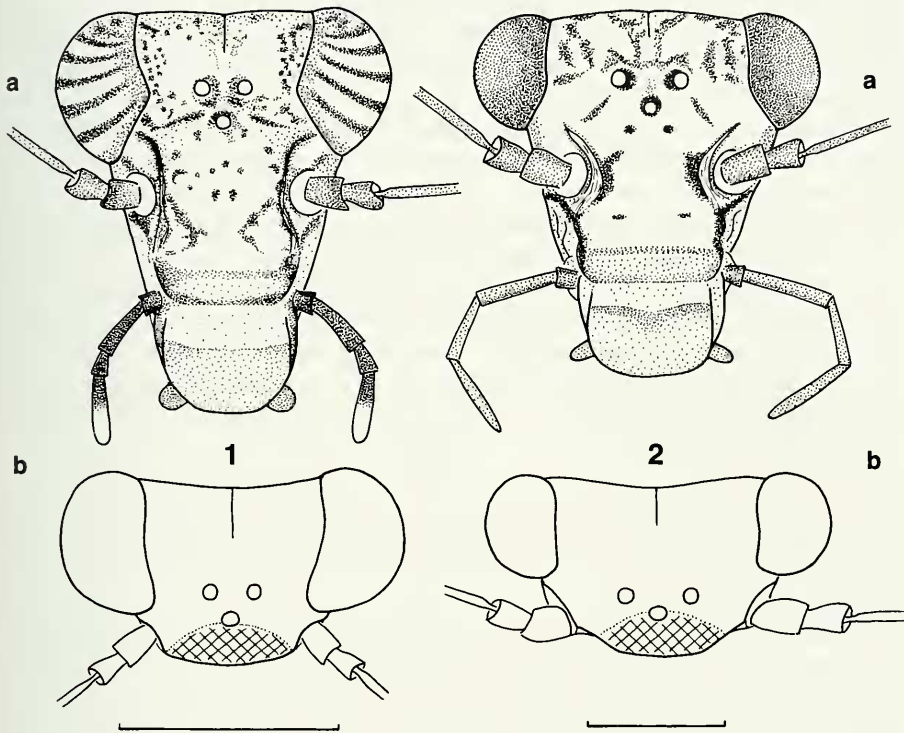
The epithet *zebrinus* (-a, -um) refers to the banded eyes recalling the colour pattern of a zebra.

DESCRIPTION (male holotype, female not known)

Coloration. Head (Fig. 1a) yellowish to light brown, with some small dark brown patches of hypodermal pigmentation. Compound eye yellowish grey with black transversal bands (observed after one month in alcohol; six months later the ground colour had turned to dark grey and the bands were hardly visible). Antenna medium brown. Maxillary palpus dark brown, except for whitish apical half of P4. Thorax yellowish to medium brown with some small dorsal and lateral spots of brown hypodermal pigment on pterothorax. Membrane of wings unmarked (Figs 3, 4), completely transparent also in PS, wing veins brown. Legs light to medium brown, tibiae with a dark brown external spot in 1/3 and 1/2 of their length and with a dark brown subapical ring (hypodermal pigment); first tarsomeres medium brown, apical 1/4 light brown, second and third tarsomeres rather dark brown. Abdomen yellowish, dorsally with numerous patches of dark brown hypodermal pigment, same pigment also ventrally in basal half. Phallosome and other terminalia light brown.

Morphology. Head (Fig. 1a) much longer than wide in frontal view. Edge of vertex regularly rounded. Vertical suture distinct, frontal suture absent, ocelli well-developed. Compound eye relatively large and prominent. Bulging postclypeus and epistomal suture not differentiated, head capsule flat or slightly concave from frontal ocellus to anterior region of clypeus, the latter slightly bulging (Figs 1a, b). Antenna long and slender, flagellomeres with annulate sculpture. Distal half of both antennae broken off, on both sides only the eight most basal flagellomeres remaining (length of incomplete antenna from base of scape to tip of f8 about 2.6 mm, see also "Measurements"). Maxillary palpus relatively short (Figs 1a, 10), about half of head length (measured in frontal view, from edge of vertex to tip of labrum), P3 slightly shorter than half of P4, P2 without sensory spur. Labial palpus with two articles, terminal one shorter than twice its width, with two thin-walled sensilla distally to middle of inner side (Fig. 8). Distal margin of labrum with a row of 5 placoids, each containing a very short conical sensillum (Fig. 13). Mandibles (Fig. 12) sickle-shaped, slightly asymmetrical, with rounded apex, lacking chewing sculpture on molar region, inner margin of incisive part with a row of small denticles, outer margin slightly serrate. Hypopharynx (Fig. 9) very similar to *Prionoglaris* (cf. Lienhard, 1998: fig. 39a), with characteristic basal sclerite; oval lingual sclerites not differentiated; tubular filaments very weakly differentiated, not fused in basal part; margin of lingua densely covered with very fine microtrichia. Lacinia virtually absent, only a microscopical remnant (Fig. 7; length about 100 μm) visible at high magnification after slide-mounting of the head.

Wings as in Figs 3 and 4, similar to *Prionoglaris*, but vein *an2* present in forewing. Wing margin and veins (except for *pcu*) with very sparse microscopical pilosity, these hairs somewhat stouter and longer on veins of hindwing, especially in apical half. Legs with uniform short overall pilosity, lacking trichobothria, with some short spine-like setae on tibiae and tarsi. Pearman's organ of hindcoxa well-developed, midcoxa with a hyaline tubercle on inner side. Preapical claws of all legs strikingly



FIGS 1-2

Fig. 1. *Siamoglaris zebrina* gen. n., sp. n., male holotype: a, head in frontal view (pilosity not shown); b, head in dorsal view (pilosity and coloration not shown, cross-hatched region flat or slightly concave). - Fig. 2. *Prionoglaris stygia* Enderlein, male (from type locality, cf. Figs 16-18): idem. Scale lines = 0.5 mm.

asymmetrical, lacking preapical tooth (Figs 5, 6). Anterior claw bearing a large membranous extension enveloping almost the whole claw, leaving only the tip of the anterior claw uncovered; the surface of these membranous structures covered with short and fine microtrichia or denticles (Fig. 5). Each anterior claw with an elongate basal process bearing also some microtrichia, and with a slender hair-like basal filament on inner side (Fig. 5). Posterior claw much simpler than anterior one, lacking membranous extension, with a relatively short basal process bearing some small microtrichia in its basal half (Fig. 6).

Male terminalia. Epiproct and paraproct (Fig. 14) similar to *Prionoglaris stygia* (Fig. 16). Epiproct regularly rounded, its pilosity relatively sparse, limited to posterior third. Paraproct densely pilose, with some longer setae on the slightly bulged dorsal part, lacking setae with basal rosettes, inner margin of paraproct strongly sclerotized, no marginal spine present. Hypandrium simple (Fig. 15), pilosity mostly in apical half, hind margin regularly rounded, basal angles with a slightly sclerotized stylus-like structure on each side. Phallosome (Fig. 11) an elongated slightly sclerotized sac (length 0.6 mm), roughly circular in cross-section, bearing the following relatively

weakly sclerotized apical processes (homologous structures described by Lienhard, 1988, 1998, for *Prionoglaris* mentioned in parentheses): medioventral process ("äusserer Medianfortsatz", "appendice médio-ventral"), mediointernal process ("innerer Medianfortsatz", "appendice médio-interne"), a pair of dorsolateral processes ("Lateralfortsätze", "appendices dorso-latéraux"). Medioventral process short and rounded, almost hemispherical, bearing a pair of membranous ventrolateral blisters (shown in their inflated state in Fig. 11). Mediointernal process well-developed, with a pair of sclerotized and apically slightly hooked claspers (subtriangular in lateral view, Fig. 11b) in its apical region and a small mediolateral protrusion. These structures partly covered by complex membranous swellings (shown in their inflated state in Fig. 11). Dorsolateral processes (not covered by these membranes) elongate, finger-like and bearing some pores on their lateral margin and some short apical hairs. Dorsolateral processes originating near mid-line of dorsal side of the phallosome (Fig. 11a) and in situ laterally prominent, situated close to ventral base of paraprocts, slightly ventrally directed in lateral view (Fig. 11b).

Measurements (holotype; in μm except for BL, FW, HW). BL = [1.6 mm] (abdomen strongly shrunk); FW = 3.4 mm; HW = 2.2 mm; F = 740; T = 1290; t1 = 710; t2 = 155; t3 = 163; IO/D = 1.14; flagellomeres of both antennae: f1 = 790/790; f2 = 270/280; f3 = 350/340; f4 = 240/250; f5 = 230/240; f6 = 200/200; f7 = 160/170; f8 = 200/200. NOTE: Both antennae are damaged in the holotype (see "Morphology"). The remaining eight flagellomeres of both antennae are practically equal in length (see measurements above). This indicates that the antennae of this specimen were not subjected to an asymmetrical regenerative length growth of the remaining flagellomeres after having been damaged during nymphal life, as it often can be observed in the suborders Trogiomorpha and Troctomorpha (cf. Seeger, 1975).

BIOLOGY

Very little is known about the biology of *S. zebrina*. However, the specialization of the mouthparts and the situation of the type locality (see "Material") suggest that the biology of this species is similar to that of *Prionoglaris* (cf. Badonnel & Lienhard, 1994): i.e. larval development essentially in subterranean habitats (in caves or under stones in rocky debris), adults sometimes also found outside caves (according to A. Baz, in litt. 1999, *P. stygia* has been captured several times outside caves in Spain, in Malaise traps and on vegetation).

KEY TO ADULTS OF THE GENERA OF PRIONOGLARIDIDAE

NOTE: Figures concerning the diagnostic characters of *Speleketor* and *Sensitibilla* have been published by Gurney (1943), Mockford (1984, 1993) and Lienhard (2000). For *Prionoglaris* see Figs 2 and 16-18, Plate 1A-C and figures published by Lienhard (1988, 1998). Due to the striking metamorphosis during adult moult in *Prionoglaris* (and very probably also in *Siamoglaris*), many features of mouthparts and pretarsal claws of nymphs of Prionoglaridinae differ greatly from those described here for adults (see Lienhard, 1988, 1998). In particular the rod-like laciniae, typical for nymphs and adults of all other Psocoptera but strongly reduced in adults of Prionoglaridinae, are well-differentiated in nymphs of this subfamily (cf. Plate 1C).

- 1 Bulging postclypeus, epistomal suture, epipharyngeal sclerite, cup-like cibarial sclerite (hypopharynx), oval lingual sclerites (hypopharynx) and rod-like laciniae well-differentiated, as usually in Psocoptera. P2 with a small subbasal sensory spur. Distal margin of labrum with a row of 5 setiform sensilla. Legs with some trichobothria. Pretarsal claws symmetrical, with a preapical tooth (or short filament), lacking basal process or filament and membranous extension Speleketorinae 2
- Bulging postclypeus, epistomal suture, epipharyngeal sclerite, cup-like cibarial sclerite and oval lingual sclerites not differentiated, laciniae reduced to a microscopical remnant (only visible at high magnification after slide-mounting of the head, cf. Plate 1B). P2 without sensory spur. Distal margin of labrum with a row of 5 placoids, each containing a very short conical sensillum (Figs 13, 17). Legs lacking trichobothria. Pretarsal claws asymmetrical, usually with a basal process and/or filament and lacking preapical tooth, anterior claw of each leg bearing a membranous extension Prionoglaridinae 3
- 2 Forefemur with a longitudinal row of articulated spines on anterior face. Trichobothria present on femora and on some trochanters. Female genitalia: ovipositor valvula simple and not fused to subgenital plate *Speleketor* Gurney
- Forefemur only with a longitudinal row of normal short hairs on anterior face. Trichobothria present on tibiae and hindtarsus. Female genitalia: ovipositor valvula basally fused to subgenital plate, with a distal process bearing spine-like setae *Sensitibilla* Lienhard
- 3 Compound eye with striking colour pattern (Fig. 1a) (only distinct in living and freshly killed animals!). Maxillary palpus relatively short, about half of head length (measured in frontal view, from edge of vertex to tip of labrum), with P3 shorter than half of P4 (Fig. 10). Terminal article of labial palpus shorter than twice its width, with two thin-walled sensilla distally to middle of inner side (Fig. 8). Vein *an2* of forewing present (Fig. 3). Membranous extension of anterior preapical claw of each leg strongly developed, covering almost the whole claw (Fig. 5). Phallosome (Fig. 11): medioventral process short and rounded, with a pair of membranous ventrolateral blisters; mediointernal process well-developed, with a pair of sclerotized and apically slightly hooked claspers; dorsolateral processes well-developed, bearing some lateral pores *Stamoglaris* gen. n.
- Compound eye uniform in colour (yellowish grey to greenish in living and freshly killed animals, dark grey to black in old alcohol material). Maxillary palpus much longer than half of head length, with P3 longer than half of P4 (Fig. 2a, Plate 1B). Terminal article of labial palpus elongate, length about twice its width, with two thin-walled sensilla basally to middle of inner side (Fig. 18, Plate 1B). Vein *an2* of forewing absent. Membranous extension of anterior preapical claw of each leg developed as a ventrointernal vesicle, not reaching apex of claw. Phallosome:

medioventral process elongate, longer than other phallic processes, lacking membranous blisters; mediointernal process short and simple, lacking apical claspers; dorsolateral processes well-developed, lacking pores *Prionoglaris* Enderlein

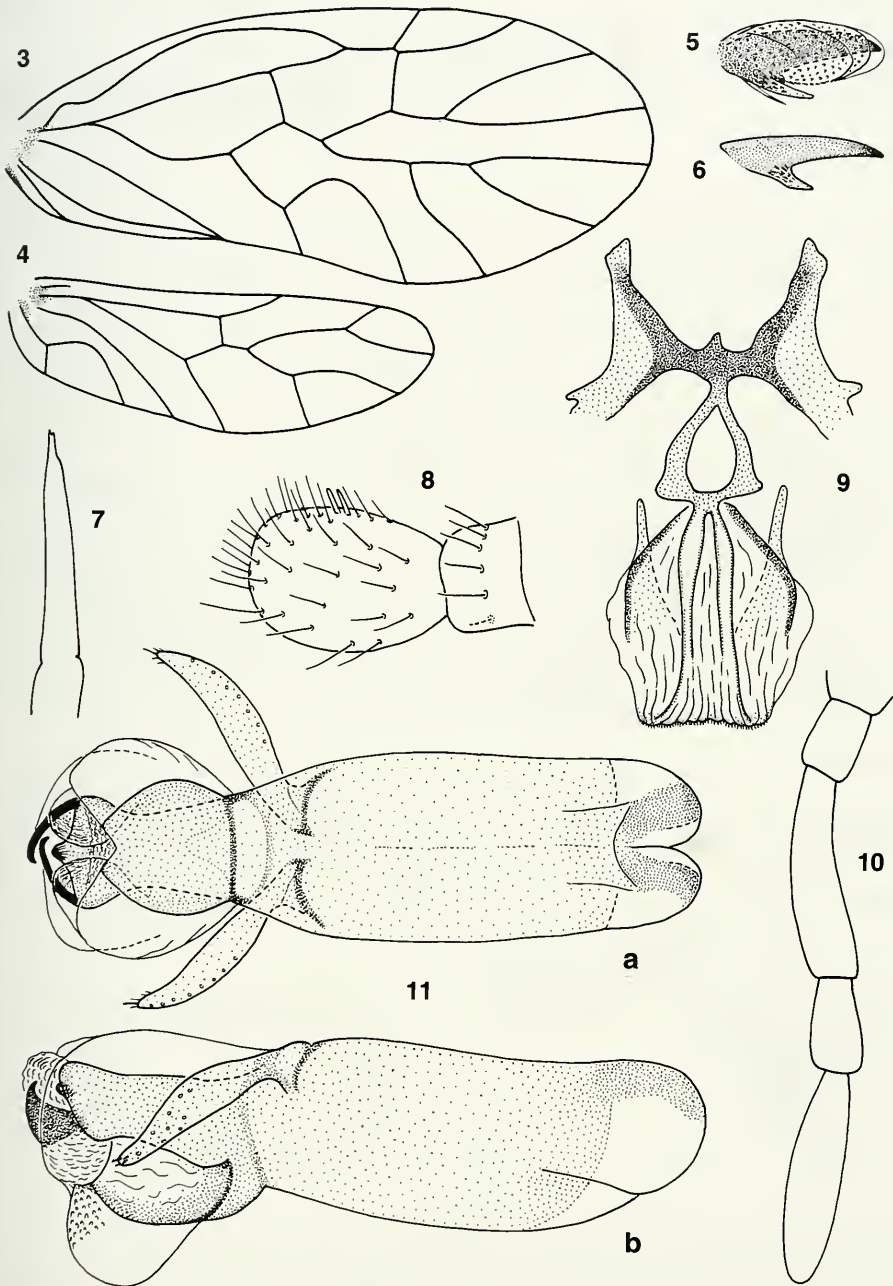
DISCUSSION

According to Lienhard (2000) the family Prionoglarididae can be subdivided into two main groups, corresponding to two phylogenetic clades, one comprising the genera *Speleketor* and *Sensitibilla*, the other the genus *Prionoglaris*. The new genus *Siamoglaris* belongs without any doubt to the second clade, which is characterized by the strongly apomorphic morphology of head capsule, mouthparts and pretarsal claws (see key to genera). The first clade is defined by the synapomorphic presence of trichobothria on legs in both genera, which otherwise have preserved a plesiomorphic morphology of head and pretarsal claws and show only a slight tendency towards a metamorphosis of the mouthparts during adult moult. This metamorphosis, unique in Psocoptera, is complete in *Prionoglaris* and *Siamoglaris*.

The very particular morphology of the phallosome in these genera, unique in Psocoptera, may be interpreted as an autapomorphy of the family (cf. Mockford, 1984). In males of *Speleketor*, *Prionoglaris* and *Siamoglaris* (the male of *Sensitibilla* is not yet known), the phallosome consists largely of a cuticular sac with a pair of "external parameres protruding posterolaterally" (cit. after Mockford, 1984: p. 179). In *Speleketor* the phallic sac is membranous and encloses some sclerotized structures (basal struts of Mockford, 1984). In *Prionoglaris* and *Siamoglaris* the phallic sac is itself sclerotized, lacking internal sclerotized structures but bearing two additional apical processes (medioventral process and mediointernal process). The posterolateral processes (dorsolateral processes of *Prionoglaris* and *Siamoglaris*) were interpreted as external parameres in *Speleketor* by Mockford (1984: p. 171), because they bear some lateral pores. Such pores are also present in *Siamoglaris* but they could not be observed in *Prionoglaris*.

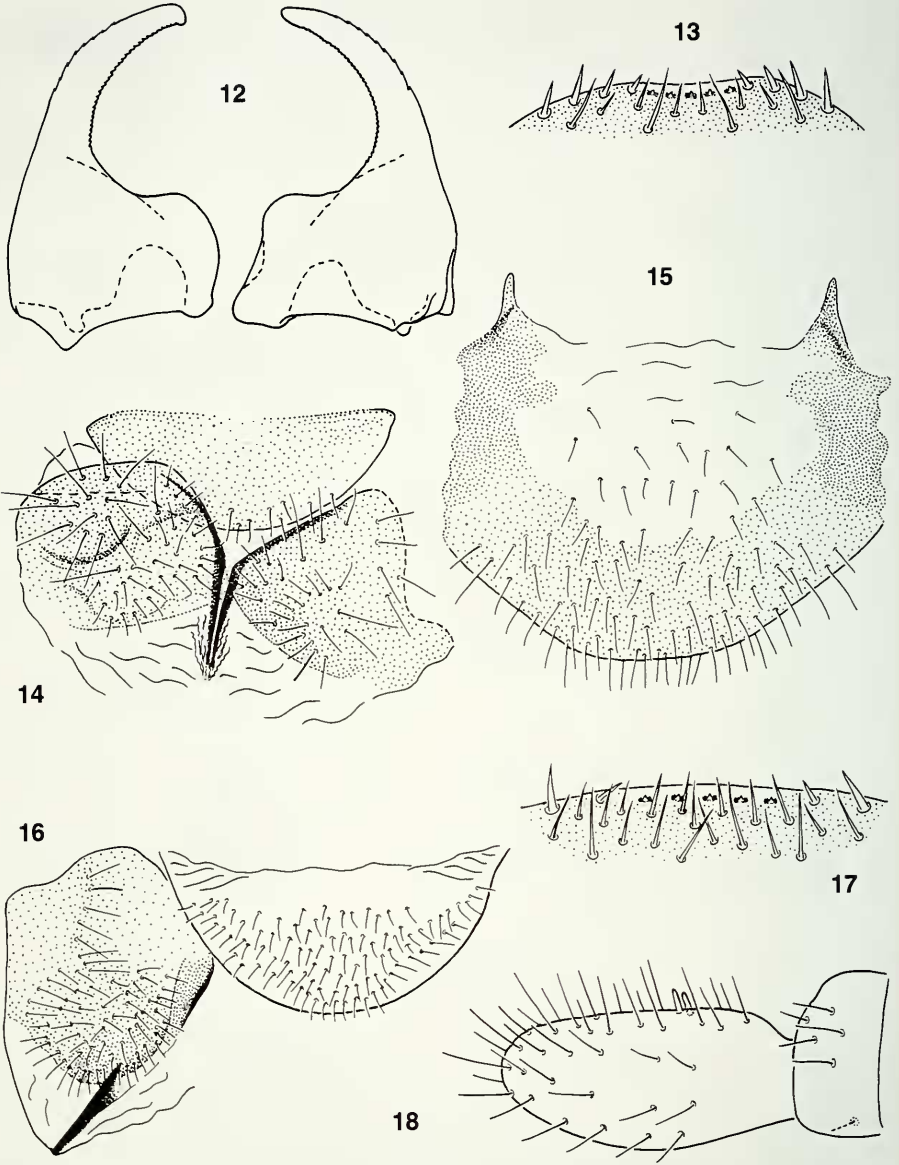
In spite of the very similar, characteristic wing venation and the probably synapomorphic basic structure of the phallosome the above mentioned groups differ from each other in several characters which usually do not vary much within families of Psocoptera (e. g. morphology of head capsule, mouthparts, pretarsal claws and pilosity of legs). Therefore these groups are considered here as subfamilies, using the family-group names proposed by Smithers (1972: p. 337, Speleketoridae) and Badonnel (1943: p. 134, Prionoglaridinae, incorrectly spelled Prionoglarinae). For diagnoses of Speleketorinae and Prionoglaridinae, see key to genera.

Fresh material of *Prionoglaris*, *Sensitibilla* and *Siamoglaris* has recently been sent to Kazunori Yoshizawa (Sapporo) for DNA extraction. The future analysis of DNA sequences and data on geographical distribution will hopefully give more information on the phylogeny of these interesting genera and on their position within the Psocoptera.



FIGS 3-11

Siamoglaris zebrina gen. n., sp. n., male holotype: 3, forewing; 4, hindwing; 5, anterior pretarsal claw of hindtarsus; 6, posterior pretarsal claw of hindtarsus; 7, remnant of lacinia (length about $100\ \mu\text{m}$); 8, labial palpus (ventral view); 9, hypopharynx (frontal view); 10, maxillary palpus (pilosity not shown); 11, phallosome, a: ventral view, b: lateral view.



FIGS 12-18

Figs 12-15. *Siamoglaris zebrina* gen. n., sp. n., male holotype: 12, mandibles (frontal view); 13, sensilla on distal margin of labrum; 14, epiproct and paraprocts (in natural position but slightly deformed and right paraproct broken along dashed line); 15, hypandrium. - Figs 16-18. *Prionoglaris stygia* Enderlein, male (from cave "Compagnaga lecia", French Pyrenees, type locality, cf. Lienhard, 1988): 16, epiproct and left paraproct; 17, sensilla on distal margin of labrum (same magnification as in Fig. 13); 18, labial palpus (ventral view, same magnification as in Fig. 8).

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